Mars Dust Impact Simulator

Dust in suspension in the Martian atmosphere can be transported by large occasional dust storms and by the more frequent dust devils. Moving dust particles can generate electrostatic charges as they come into contact with surfac es. Wind driven particles can also collide with each other, transferring charge between them at each collision. Such charge separation generates electrostatic potentials that can damage equipment used on landing Mars missions. Charged dust particles can also adhere to solar cells and thermal radiator surfaces, degrading their performance.

To quantify the electrostatic characteristics of materials exposed to dust particles of similar composition to Martian dust, the Electromagnetic Physics Laboratory and Dynacs Engineering are designing a system to simulate the transportation of dust particles at speeds comparable to the highest speeds recorded on Mars during a dust storm. Comparison of absolute photometry of the Martian sky obtained by the Imager for Mars Pathfinder with multiple scattering models have shown that the mean particle radius for airborne dust is 1.6 ? 0.15 ?m. The amount of dust loading during a Martian dust devil has been estimated to be 700 times that of ambient background. Maximum dust particle density has been calculated to be 2000 particles/cm^3. The Viking mission recorded winds speeds of 30 m/s.

The Mars Dust Impact Simulator shown in the diagram will use a piezoelectric device driven by a signal generator to vibrate the particles, mechanically separating them and placing them under fluidized conditions. Once the particles are separated, the conductive impeller blades will thrust the particles onto several surfaces backed by electrometer sensors at velocities up to 30 m/s, simulating the Martian winds. The motion of the particles will be continuous and the particles will impact the materials at angles nearly perpendicular to the surface. The simulator is small and is being designed as a self-contained low-temperature vacuum system. The temperatures and atmospheric pressures on the surface of Mars will be reproduced using a 100% CO_2 atmosphere.

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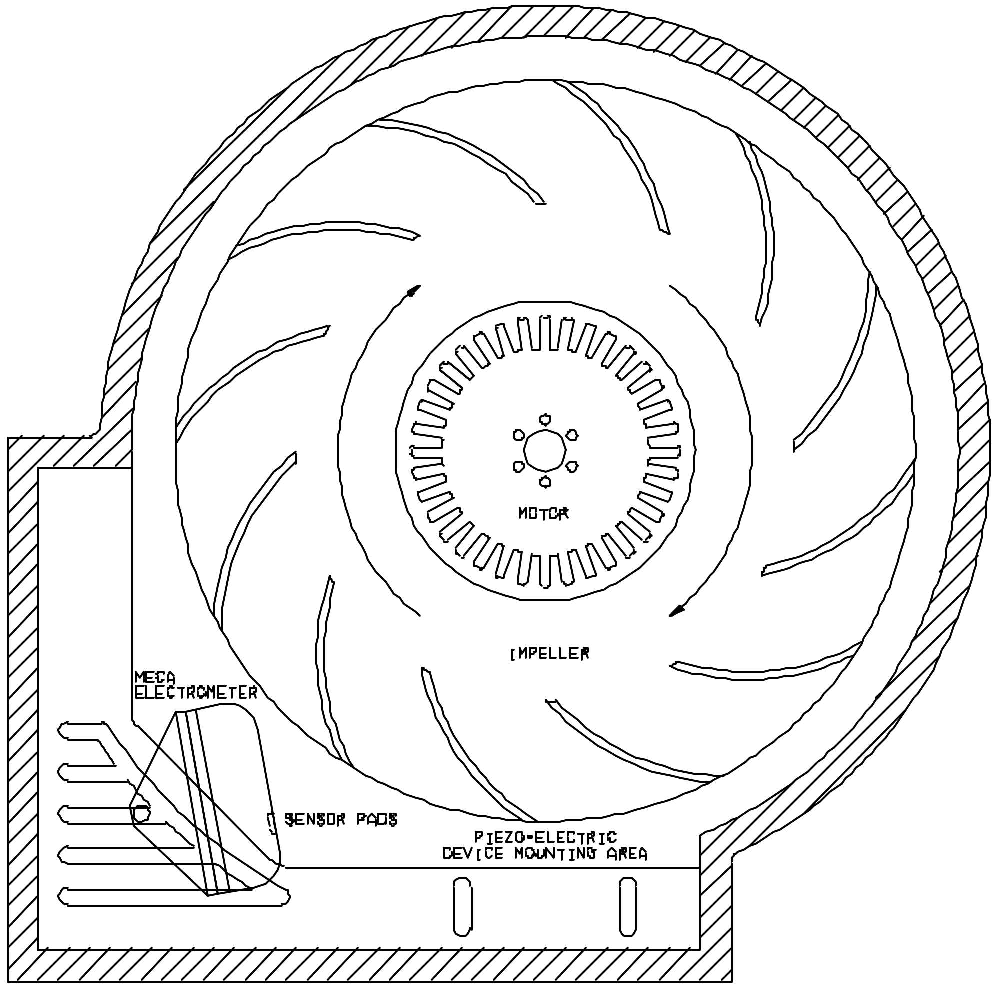

Conceptual design of Mars Dust Impact Simulator.